Material for Preliminary Examination B – Numerical Analysis Section

The following list gives topics on which the Preliminary Examination B in *Numerical Analysis* will be based. Math 5339 covers many, but not necessarily all, of these topics. Students (even those who have taken Math 5339) are advised to prepare for the examination using many resources, including (but not limited to) the books suggested below.

1. Linear Systems
   1.1 Gaussian Elimination with Pivoting
   1.2 Matrix Inversion
   1.3 Matrix Factorization and Special Matrices
   1.4 Norms of Vectors and Matrices
   1.5 Iterative Methods for Solving Linear Systems (Jacobi, GS, SOR, CG)

2. Initial Value Problem (IVP) for ODE
   2.1 Euler’s Method
   2.2 Runge-Kutta Methods
   2.3 Multistep Methods
   2.4 High-Order Equations
   2.5 Stability and Stiff Differential Equations

3. Boundary Value Problem (BVP) for ODE
   3.1 The Linear Shooting Method
   3.2 Finite Difference Method for Linear and Nonlinear Problems

4. Numerical Solution for PDE
   4.1 Elliptic PDE
   4.2 Parabolic PDE
   4.3 Hyperbolic PDE

*Suggested Reading*: Numerical Analysis, R.L.Burden and J.D.Faires (7th or 8th Edition), Published by Thomson, ISBN 0-534-39200-B